

takes place in its condition exert a more direct influence over them. The lichen covers the exposed surface of the rock; and by the retention of moisture accelerates its decomposition. The mosses next establish themselves in the hollows and crevices, and by degrees prepare a soil for the *stercoriferous* vegetable. These last attempt to establish themselves in such a manner as to banish to the still barren districts the first fabricators of their soil. The most perfect plants are in general, independent of the animal kingdom, or able to subsist without their presence. The members of that great family, indeed, are their enemies rather than their friends.

The animal is in a great measure dependent on the vegetable kingdom for food and shelter. Some animals live directly on plants as their only nourishment and others live on the flesh of other animals; but these last are, in general, supported by vegetable food. Hence we may assert, with confidence, that if the vegetable kingdom were to perish, the extinction of life, in the more perfect animals at least, would inevitably follow: some of the less perfect animals are more independent in their condition. The infusoria appear to subsist by decomposing water. They, however, prepare a suitable repast for the annulose and molluscon tribes; and these, in their turn, contribute to support the vertebral races.—In both kingdoms, therefore, the smallest and most obscure species are subservient to the welfare of those which are larger and more perfect.

In viewing the relation of these great classes of beings to one another we perceive an admirable adaptation of means to the establishment and continuance of the present order of things. The surface of our globe exhibits a great variety of *situation* for the residence of plants.—Part is occupied by land, and part is covered with water. The land varies in composition and moisture; the water in its contents and motion; and both vary in their temperature. But however different these situations appear to be, there are plants peculiarly adapted for each, in which they flourish with the greatest vigour, and where they are only restrained within fixed limits by the physical character of their station.

The condition of the earth, which thus presents different situations for the species of the vegetable kingdom, influences the species of the animal kingdom in a similar manner. But animals are not only dependent on the physical character of their *station*, but on the presence of those vegetables on which they subsist, whether directly or indirectly. In the existing arrangements animals are distributed with regard to plants, in such a manner as that a supply of food may be readily obtained, limited, however so as to prevent the excessive increase of any particular species. In their turn animals influence the growth of plants by keeping many species within due bounds, and by assist-

ing the dissemination and nourishment of others. But amidst this variety of action and reaction, and of temporary derangement, circumstances always arise by which irregularities are checked, losses compensated, and the balance of life preserved.

Linnaeus, from the contemplation of this subject, concluded, contrary to the generally received opinion, that animals were created on account of plants, not plants on account of animals. The defence of this opinion rests on the consideration of animals having organs suitable to cut and bruise vegetables as food, and by these operations sometimes contributing to preserve an equal proportion among the species; and on the following reasoning—that the iron was not made for the hammer but the hammer for the iron—the ground not for the plough but the plough for the ground—the meadow not for the scythe, but the scythe for the meadow.* The exclusive consideration of the indirect consequences of the actions of animals has obviously betrayed *Linnaeus* into this opinion. That it is erroneous may be easily demonstrated by the employment of his own method of reasoning. Plants we know are furnished with roots to penetrate the soil for nourishment and support; and fishes have fins adapted for swimming. Now if the soil was not made for plants, but plants for the soil; if the sea was not made for fish, but fish for the sea, then instead of considering animals as created on account of plants, we must draw the mortifying conclusion that both animals and vegetables were created on account of inorganic matter the living for the sake of the dead.

All that we know with certainty on the subject amounts to this, that the organised kingdom is dependent on the inorganic: that animals are greatly dependent on vegetables; and that the different tribes in each kingdom have determinate mutual relations. Judging from the mode of action peculiar to the species of each kingdom, we are led to conclude that vegetables are superior in the scale of being to minerals; that animals are superior to plants; and that they constitute a harmonious whole, in which the marks of power, wisdom, and goodness, are everywhere conspicuous.—*Ibid.* vol. 1. p. 49.

* *Amoenitas Academica*, vol. vi. p. 22.

From the Farmers' Gazette. ARTIFICIAL MANURES.

THE use of artificial manures is quite a new feature in agricultural practice: it has arisen from the investigations made by scientific men, into the nature of those substances which form the inorganic part of plants. As we have formerly stated these investigations proved that there were certain mineral substances which formed a very important part in the composition of all vegetables; that each species of plant had a particular class of predominant substances in quantities peculiar to

itself, and which were derived from the soil. It, therefore, followed that if the precise quantity of each substance required by any variety of our cultivated plants was added to soil, we would furnish the very kind of matter which was necessary to insure a crop of that particular species of plant which we wished to grow.

It has been often observed, when one particular substance (such as nitrate of soda) was used alone, that its effects were barely visible, or even injurious; but that when mixed with another substance—which in the same manner would have been productive of very little good, if applied by itself—then that the united effects produced by these substances were much greater than those which resulted even from a successful application of either of them singly. As these manures when applied alone, in many cases did not very satisfactorily, the cause of such different results being produced by the same substance was a mystery quite unknown to the great majority of agriculturists; but we are now aware that it arose from the circumstance that when the application was successful, a certain variety of the food of plants had been supplied to a soil, in which it had been previously wanting; and, again, when little benefit was derived, it showed that the soil contained already a sufficient supply of that particular kind of matter, for the plants cultivated upon it. The uncertainty, therefore, which attended the use of one variety of inorganic food—the success, again, which attended the application of that substance, when mixed with others—and a knowledge of the fact, that farm-dung, and other powerful manures of that class, consisted of a great variety of substances, all contributing to promote the growth of plants—led to the consideration of the question, whether artificial mixtures could not be made so as to combine all of those different substances which were suited for each peculiar variety of plant. It is quite evident that, in the prosecution of such an inquiry, the more practical knowledge of the agriculturalist, however eminent that might be, was unable to guide him, and therefore the assistance of the chemist was essentially necessary, because it was he alone who could determine the nature of those substances which enter into the composition of the various classes of cultivated plants, and thus point out the various forms of inorganic matter which would supply to each variety of plant those substances which it, in particular, required. Although this branch of scientific agriculture is as yet in its infancy, still the results which have been obtained fully warrant us to expect others even more important, and altogether the subject of artificial manure is one of very deep interest, both to the practical agriculturalist as well as to the chemist.

We shall now proceed to lay before our readers a short account of the nature and effects produced by such artificial